

# Performance Measure Profile

## Noise Exposure

### FY 2013 Methodology Report



Federal Aviation  
Administration

#### Performance Measure Applicability

☒ **DOT Strategic Plan**

**Goal:** Environmental Sustainability

**Outcome:** Reduction in transportation-related air, water and noise pollution and impacts on ecosystems.

**Metric:** Improve Aviation Noise Exposure (the U.S. population exposed to significant aircraft noise around airports) from 307,420 persons in 2011 by at least 2 percent per year to less than 328,000 persons in 2016.<sup>1</sup>

☐ **Agency Priority Goal**

☒ **Destination 2025**

**Goal:** Sustain Our Future

**Outcome:** U.S. aviation is a model for sustainable growth.

**Metric:** The U. S. population exposed to significant aircraft noise around airports has been reduced to less than 300,000 persons.

#### FY 2013 Performance Target

Reduce the number of people exposed to significant aircraft noise to less than 371,000 in calendar year 2012.

**Lead Organization:** Policy, International Affairs & Environment (APL)

	FY 2009	FY 2010	FY 2011	FY 2012 <sup>2,3</sup>	FY 2013
<b>Target</b>	436,000	419,000	402,000	386,000	371,000
<b>Actual</b>	383,000	292,000	318,000	315,000	321,000

#### Definition of Metric

<b>Metric Unit:</b>	Number of persons exposed to significant aircraft noise. Significant aircraft noise levels as currently defined as values greater than or equal to Day Night Average Sound Level (DNL) 65 decibels dB. The target is determined by reducing the 2005 population exposed to significant aircraft noise by 1 percent in 2006, and by a 4 percent compounded rate from 2007 to 2018. For each fiscal year, the number of people exposed in the previous calendar year is reported.
<b>Computation:</b>	Beginning in FY12, the estimates of the number of people exposed to significant noise are calculated from the Aviation Environmental Design Tool (AEDT). Prior to the use of AEDT, estimates were calculated using the Model for Assessing Global Exposure to the Noise of Transport Aircraft (MAGENTA). The computational core of AEDT is FAA's Integrated Noise Model (INM) with methodological improvements. INM is the most widely used computer program for the calculation of aircraft noise around airports. In FY14, INM will be replaced

<sup>1</sup> The previous target of 1 percent per year remained in effect from 2005 to 2006. The 4 percent compounded rate of reduction began in 2007.

<sup>2</sup> For FY 2012, targets and results for this metric were changed from percent of population exposed to the number of persons exposed. The prior year's targets and results have been recalculated from the original percentages.

<sup>3</sup> For years before 2012, year 2000 Census data population density projected to the current year was used to calculate the number of people within the DNL 65 dB contour at each airport.

	<p>by AEDT as the regulatory tool to calculate airport noise around airports. Major assumptions on local traffic utilization come from obtaining INM datasets that were developed for an airport and ETMS.</p> <p>The AEDT model calculates individual DNL contours for the top 101 US airports using detailed flight tracks, runway use and track utilization. The contours are superimposed on year 2010<sup>4</sup> Census population densities projected to the current year being computed to calculate the number of people within the DNL 65 dB contour at each airport. For smaller airports, AEDT uses less detailed information consisting of flight tracks that extend straight-in and straight-out from the runway ends. The contours areas are then used to calculate people exposed using 2010<sup>5</sup> Census population densities projected to the current year being computed. The projection is used to account for population growth between 2010 and the computed year. The individual airport exposure data are then summed to the national level. Finally, the number of people relocated through the Airport Improvement Program is subtracted from the total number of people exposed.</p> <p>In addition, military operations for the KC-135 were updated based on more accurate information from the Air Force. Older, louder KC-135's are being phased out of service, producing smaller contours at some airports.</p>
Formula:	<p>The number of people exposed to significant aircraft noise is calculated as follows:</p> $\sum_{i=1}^n POP65_i - \sum_{j=1}^9 POPREL_j$ <p>Where, POP65<sub>i</sub> is the number of people residing in the DNL 65 dB contour at the i<sup>th</sup> Noise Inventory airport as of the current year being computed projected from the 2000 or 2010 Census<sup>6</sup> and n is the number of Noise Inventory airports. A Noise Inventory airport is defined as any airport that reported having at least 365 jet departures for the year being used in the analysis. POPREL<sub>j</sub> is the number of people relocated from the DNL 65 dB contour in the j<sup>th</sup> FAA region since the year 2000.</p>
Scope of Metric:	<p>The metric tracks the residential population exposed to significant aircraft noise around U.S. airports. Significant aircraft noise is defined as aircraft noise above a Day-Night Average Sound Level (DNL) of 65 decibels. In 1981, FAA issued 14 CFR Part 150, Airport Noise Compatibility Planning, and as part of that regulation, formally adopted Day Night Average Sound Level. Day Night Average Sound Level, abbreviated as DNL and symbolized as Ldn, is the 24-hour average sound level, in db, obtained from the accumulation of all events with the addition of 10 decibels to sound levels in the night from 10 PM to 7 AM. The weighting of the nighttime events accounts for the increased interfering effects of noise during the night when ambient levels are lower and people are trying to sleep.</p> <p>In the promulgation of 14 CFR Part 150, FAA also published a table of land uses that are compatible or incompatible with various levels of airport noise exposure in DNL. This table established that levels below DNL 65 dB are considered compatible for all indicated land uses and related structures without restriction.</p>
Method of Setting Target:	<p>The target was set by analyzing the historical rate of change of noise exposure and taking into account recent events and long term projections of air traffic demand. As air traffic grows over time, noise exposure is likely to move upwards. The target will continue to be re-assessed as we take a more integrated approach to environmental regulation – assessing the relative costs and benefits of noise, local air quality, and greenhouse gas emissions – and the trade-offs in achieving reductions in each.</p>

#### Why the FAA and/or DOT Choose this Metric

<sup>4</sup> For years before 2012, year 2000 Census data population density projected to the current year was used to calculate the number of people within the DNL 65 dB contour at each airport.

<sup>6</sup> For years prior 2012, year 2000 Census data was used, for 2012 forward, year 2010 Census data is used for the projection.

Mitigating noise directly impacts our ability to increase capacity while sustaining our future. Although building new runways is the best way to increase capacity, communities and local government are reluctant to build them if they impose increased aircraft noise exposure. By mitigating and reducing exposure to excessive noise, FAA can help communities accept more runways in their areas.

The number of people exposed to significant noise levels was reduced by about 90 percent between 1975 and 2000. This is due primarily to the legislatively mandated transition of airplane fleets to newer generation aircraft that produce less noise. Most of the gains from quieter aircraft were achieved by FY 2000. The remaining problem must be addressed primarily through airport-specific noise compatibility programs along with reduction at the source. The FAA pursues a program of aircraft noise control in cooperation with the aviation community. Noise control measures include noise reduction at the source, i.e., development and adoption of quieter aircraft, soundproofing and buyouts of buildings near airports, operational flight control measures, and land use planning strategies. The FAA is authorized to provide funds for soundproofing and residential relocation, but each project must be locally sponsored and be part of a noise compatibility program prepared by the airport sponsor and approved by FAA.

The base year for setting the target is 2005. This base year was selected starting with FY 2010 to account for the significant changes to the commercial fleet from the previous baseline. The target remains at a rate of reduction of one percent in 2006 and a four percent compounded reduction from 2007 to present. Environmental trends based on expansion of the U.S. air transportation system show that noise exposure is likely to move upwards as traffic growth continues – even taking into account forecasted fleet changes and implementation of beneficial new air traffic procedures. The agency's ability to develop next generation technologies and have the broadest possible array of available noise mitigation approaches at its disposal will affect FAA's ability to continue making significant improvements in aviation noise exposure.

#### **Public Benefit**

Public benefit is reduced exposure to unwanted aircraft noise and increased capacity, reducing airport congestion and delays.

#### **Partners**

Partners include government agencies worldwide and the aviation industry through the International Civil Aviation Organization (ICAO), who periodically update noise standards and methodologies. The FAA has also partnered with NASA in the development of continuous lower energy, emissions and noise (CLEEN) technologies for civil subsonic jet airplanes to help achieve NextGen goals to increase airspace system capacity by reducing significant community noise and air quality emissions impacts in absolute terms and limiting or reducing aviation greenhouse gas emissions impacts on the global climate.

#### **External Factors Affecting Performance**

The primary external factors affecting performance are market forces that drive changes in commercial aircraft fleets and operations. Other external factors include providing FAA the authority and funding to accelerate the implementation of new aircraft emissions and noise technology, and providing funding to FAA's Airport Improvement Program. These programs help foster the type of fleet and performance change required to meet either our current target or historic experience.

#### **Source of the Data**

The Aviation Environmental Design Tool, AEDT<sup>7</sup>, is used to track airport noise exposure. AEDT uses updated population data from the 2000 and 2010 Census projected to the current year to account for population growth. The data source for airport traffic is FAA's Enhanced Traffic Management System (ETMS). This database has replaced the original source, the Official Airline Guide (OAG). Unlike the OAG, the ETMS database includes unscheduled air traffic, which allows for more accurate modeling of freight, general aviation, and military operations. The ETMS also provides more details on aircraft type for a more accurate distribution of aircraft fleet mix.

The current year's result is the number of people exposed in the previous calendar year. Data on the number of people relocated through the Airport Improvement Program are collected from FAA regional offices. Local traffic utilization data are collected from individual airports and updated periodically.

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<sup>7</sup> AEDT replaced the Model for Assessing Global Exposure to the Noise of Transport Airplanes (MAGENTA) in FY12 for computing population exposed to noise

A task group formed to review MAGENTA and AEDT by the Committee on Aviation Environmental Protection (CAEP) under the International Civil Aviation Organization (ICAO) has thoroughly reviewed both model's population exposure methodology and has validated it for several airport specific cases. MAGENTA played an important role in the setting of new international aircraft noise standards by CAEP in 2001. CAEP has used AEDT to assess the benefits (reduction in number of people exposed to aircraft noise) of several noise stringency proposals.

#### **Statistical Issues**

This metric is derived from model estimates that are subject to errors in model specification. Trends of U.S. noise exposure may change due to annual improvements to the noise exposure model. A major change to AEDT (Aviation Environmental Design Tool) would result in a significant change in the estimate of the number of people exposed to significant noise levels around US airports.

#### **Completeness**

No actual count is made of the number of people exposed to aircraft noise. Aircraft type and event level are current. However, some of the databases used to establish route and runway utilization were developed from 1990 to 1997, while others have been updated more recently. Changes in airport layout including expansions may not be reflected. The FAA continues to update these databases as they become available. The benefits of federally funded mitigation, such as relocation, are accounted for.

#### **Reliability**

The Integrated Noise Model (the core of the AEDT model) has been validated with actual acoustic measurements at both airports and other environments such as areas under aircraft at altitude. AEDT has gone through extensive validation through an ICAO workgroup and through its own design review group. The AEDT population exposure methodology has been thoroughly reviewed by an ICAO task group and was most recently validated for a sample of airport-specific cases.